Assisted Medical Procedures (AMP)

Completed Technology Project (2008 - 2015)

Project Introduction

The Assisted Medical Procedures system (AMP) is an electronic system that will help crewmembers select the appropriate medical procedure for a particular medical encounter, as well as guide them through that procedure. The system will be used for all medical encounters, especially during periods of exploration missions when contact with ground resources (e.g., flight surgeon) will be either minimal or absent. During these periods of autonomous medical care, the crew will need such a system for medical events, be they urgent or non-urgent. Development of the AMP addresses several risks stated in the Critical Path Roadmap (CPR; also known as the NASA Bioastronautics Roadmap [NASA/SP-2004-6113]). The following list explains the risks and how the AMP will address them. Risk #17: Monitoring and Prevention. The risk of serious medical events may increase due to inadequate monitoring and prevention capabilities. The AMP will enable astronaut crew medical officers (CMOs) to properly monitor the health of each crewmember and subsequently provide direction to prevent medical issues from arising during exploration missions. Risk #20: Ambulatory Care. Impaired performance and increased risk to crew health and mission may occur due to lack of capability to diagnose and treat minor illnesses. The AMP will have clinical decision support (CDS) logic. Within the scope of this project, CDS is defined as an active knowledge system which uses patient data, both collected and stored, to generate case-specific diagnostic and treatment advice. The CDS within the AMP will then provide the CMO with treatment procedures to be executed on the ill crewmember. This action will decrease mission risk and increase crew performance. Risk #22: Medical Informatics, Technologies, and Support Systems. Limited communication capability during space flight results in the compromised ability to provide medical care, and may have adverse consequences for crew health. The AMP will consist of CDS logic and procedure execution support logic that will enable CMOs to autonomously manage medical events, especially during periods of exploration missions when contact with ground resources (e.g., flight surgeon) is either minimal or absent. Risk #23: Medical Skill Training and Maintenance. Inability to perform required medical procedures may result from inadequate crew medical skills or medical training. The AMP will be able to provide "just-in-time" instruction to CMOs in the absence of remote guidance instruction from ground-based subject matter experts (SMEs). The instruction material provided by the AMP will be generated by SMEs and thus fill any gaps in crew medical skills or medical training. The AMP is a component of the Exploration Medical System Demonstration (EMSD) Operational Concept Document [JSC 66295]). The initial project charter for the EMSD includes the execution of a Ground Demonstration, to be conducted in a ground-based flight analog environment, and a Flight Demonstration, to be conducted in-flight aboard the International Space Station (ISS).

Anticipated Benefits

It is anticipated that the development of the AMP will result in innovations to

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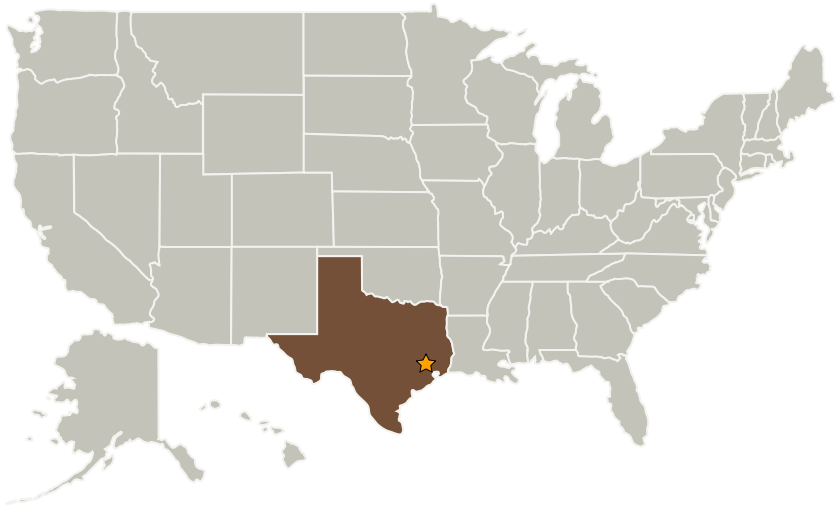
interfaces with wireless medical peripherals (e.g., ECG monitors, pulse oximetry), informatics tools (e.g., electronic medical record, middleware), and to autonomous medical care in austere environments.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Wyle Integrated Science and Engineering Group	Supporting Organization	Industry	

Primary U.S. Work Locations
Texas

Project Transitions

October 2008: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

Sharmila D Watkins

Principal Investigator:

Victor W Hurst

Co-Investigators:

David A Rubin
Duane A Chin

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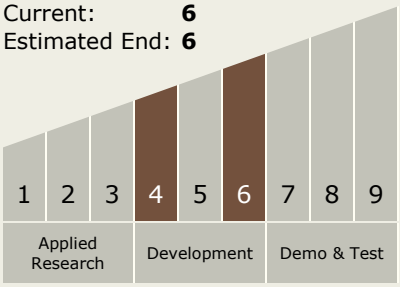
March 2015: Closed out

Closeout Summary: DOCUMENTATION, DEVELOPMENT, AND PROGRESS The AMP was initially being developed as part the Advanced Integrated Clinical System (AICS)-Guided Medical Procedure System for the Constellation Program. The Exploration Medical Capability (ExMC) team generated an OpsCon document and, subsequently, a set of functional and technical requirements. All of these documents were reviewed and approved by the Johnson Space Center (JSC) Space Medicine Configuration Control Board in 2009 and 2010, respectively. These documents were then archived when the Constellation Program was canceled in 2010. Fiscal Year 2012 (FY12) brought the start of the EMSD project and the initial development of the AMP. The Exploration Medical Capabilities (ExMC) element generated a new OpsCon document for the AMP to reflect how it would be used for the EMSD. This document was approved by the ExMC Advisory Board and then used to generate functional and technical requirements. These requirements were reviewed by the ExMC Advisory Board and during the EMSD's System Requirements Review in March 2012. The ExMC Team then used the finalized requirements to conduct a thorough market survey and Request for Proposal (RFP) process. Upon completion of the RFP process, the EMSD project team determined that no CDS solution existed that adequately satisfied the project requirements within budget constraints. Although CDS is an important aspect of the long term vision of the EMSD project, this class of software is still in the early stages of commercial development and the lack of solution within the project's budget dictated that the requirement for this capability be removed from the project. The EMSD project team proposed this removal and ExMC management approved it. However, the system infrastructure of the EMSD, including the AMP, has been designed to support the integration of CDS software if, or when, a viable option exists. Completion of the RFP process also resulted in the EMSD project team electing to pursue the modification and use of WebPD, a procedure viewer created by S&K Aerospace within the JSC-Engineering (ER) group. WebPD satisfied all core requirements of the AMP component as specified in the Statement of Work and the AMP System Requirements Document (SRD). The EMSD team adopted WebPD for the AMP with the knowledge that custom development would be required for full integration into the overall EMSD system. In addition, WebPD had no initial procurement cost and developers with the JSC-ER group were available to assist in development of the system to meet the needs of the EMSD project, including AMP development. The approach for modifying and integrating the AMP into the EMSD was finalized during the EMSD Preliminary Design Review in June 2013. Following the EMSD's Critical Design Review in January 2014, the EMSD project team and Exploration Medical Capability (ExMC) Element Management concluded that the Flight Demonstration would not provide any unique opportunities for meeting project objectives nor would it present a justifiable return on investment. Accordingly, the project team recommended that the Flight Demonstration objective be removed from the project. ExMC Management, with concurrence from the NASA Human Research Program (HRP), removed the requirement for a Flight Demonstration and agreed that all verification and validation of the EMSD, including the AMP, would occur on the ground. The AMP user interface serves as the primary method for user interaction with the EMSD system. The project team reduced development time by modifying the existing WebPD graphical user interface to meet the needs of the EMSD system. The primary elements that make up the AMP user interface include a combination of text and numeric data fields, buttons, and list boxes for manual data entry, command execution and display; rich content fields for image and real-time media data capture, playback and display; and various windows areas for allowing user navigation. The AMP was designed to pres

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.1 Medical Diagnosis and Prognosis

Target Destinations

The Moon, Mars

Stories

Abstracts for Journals and Proceedings
(https://techport.nasa.gov/file/25211)

Project Website:

https://taskbook.nasaprs.com